# **Enabling Science Missions**with Advanced Autonomy

## Intelligent Mission Management for UAV Wildfire Response

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http://geo.arc.nasa.gov/imm

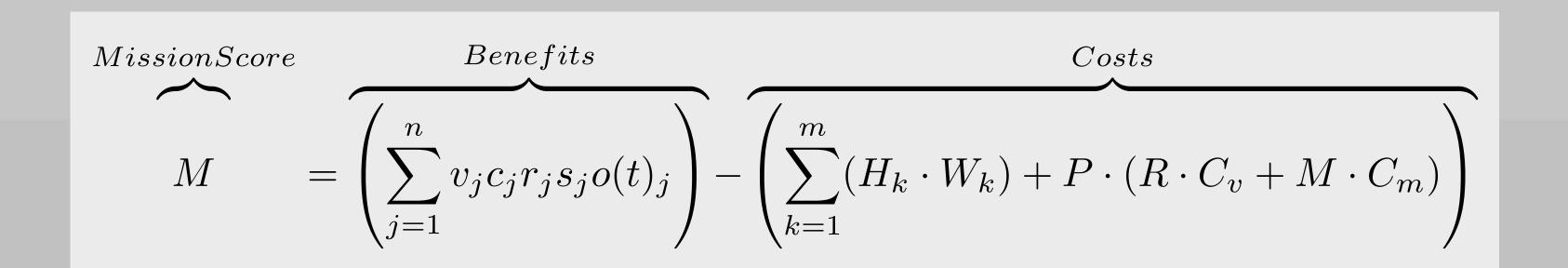
The Intelligent Mission Management (IMM) project unites flight control, autonomy, smart payload and decision support technologies to enable long-duration science missions and increase total mission effectiveness.

As mission lengths increase to accommodate larger, more widely dispersed phenomena, requirements for crew support increase dramatically. Advanced autonomy and decision-support systems developed for IMM enable longer missions by reducing operator and crew workload.

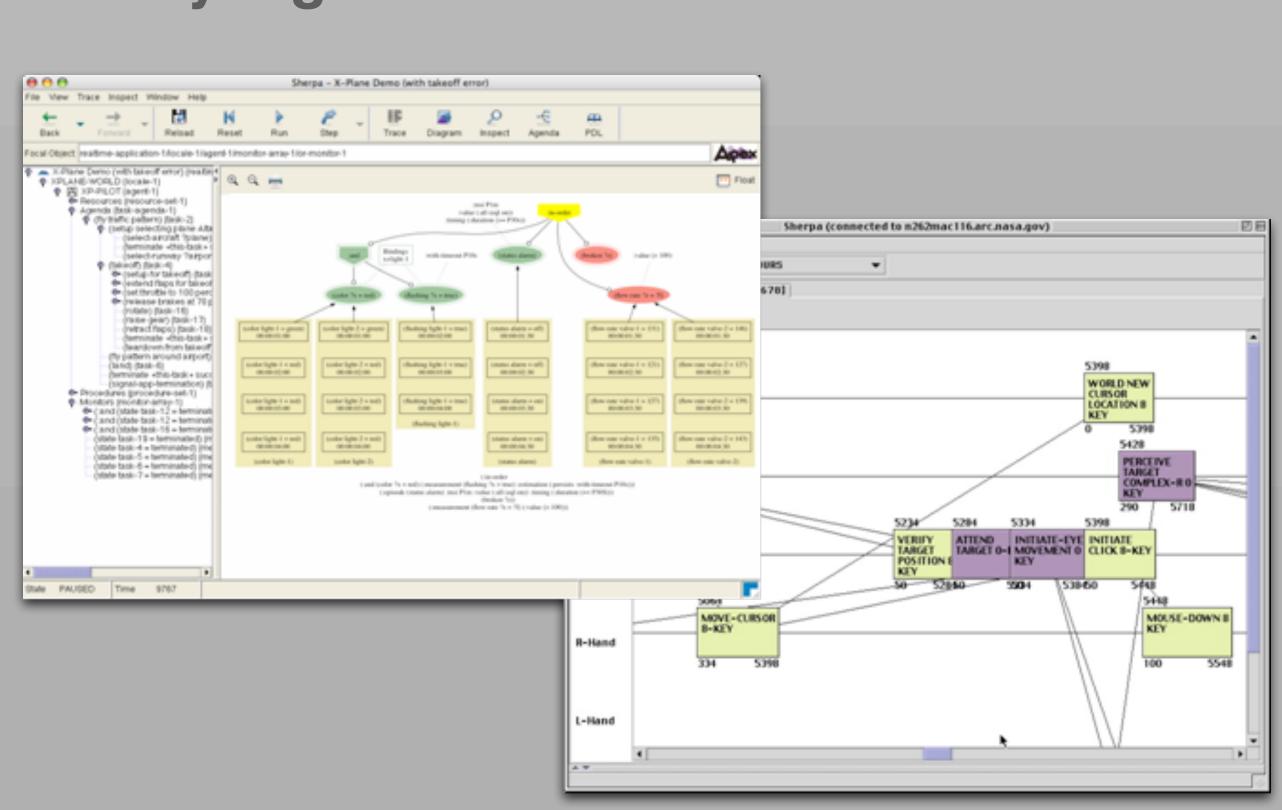
#### MISSION AUTONOMY SOFTWARE

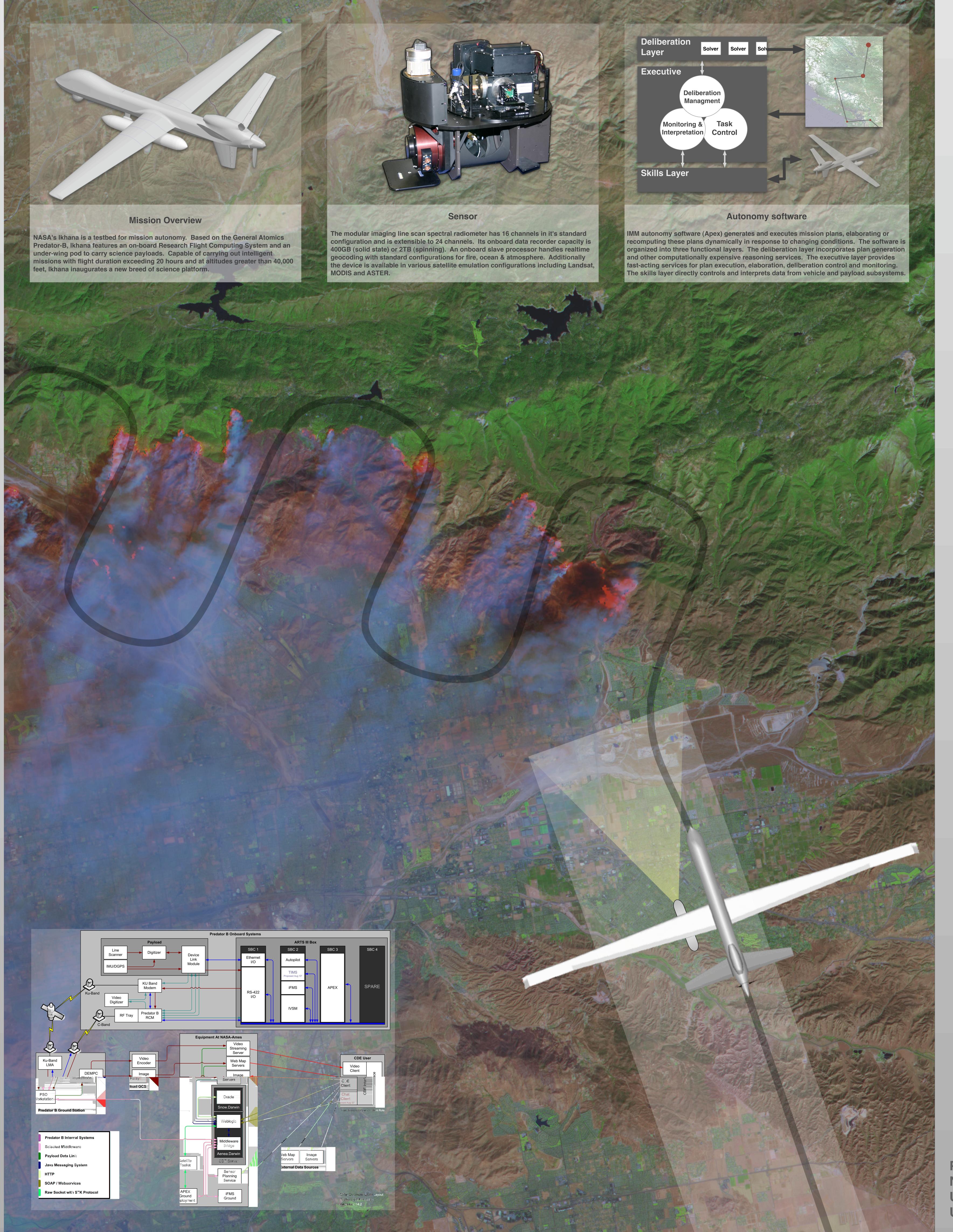
IMM systems, together with intelligence built into the payload, ensure that the right science data are acquired in the right place and at the right time.

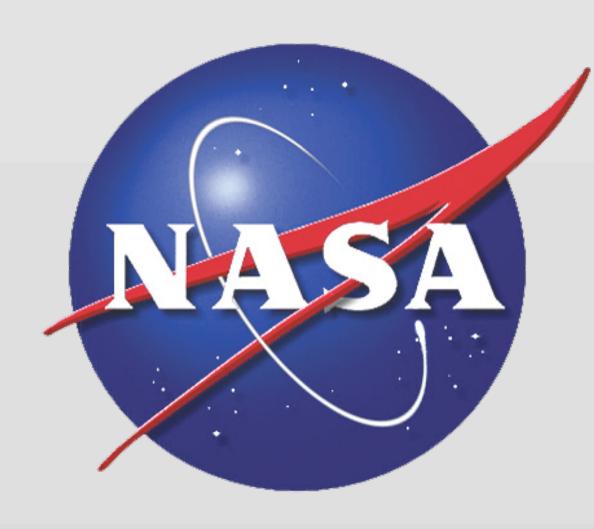
Generating Mission Plans: The the objective of the mission planning algorithm is to create an optimal plan given a mission metric. E.g.



executive commands subsystems to carry out mission plans and monitors for conditions affecting plan viability or optimality – e.g. changes in weather, fuel, vehicle and payload health status and user data product needs. The executive responds to changing conditions, modifying the mission plan or initiating replanning if needed. Apex's Sherpa UI provides tools for visualizing autonomy logic and behavior.

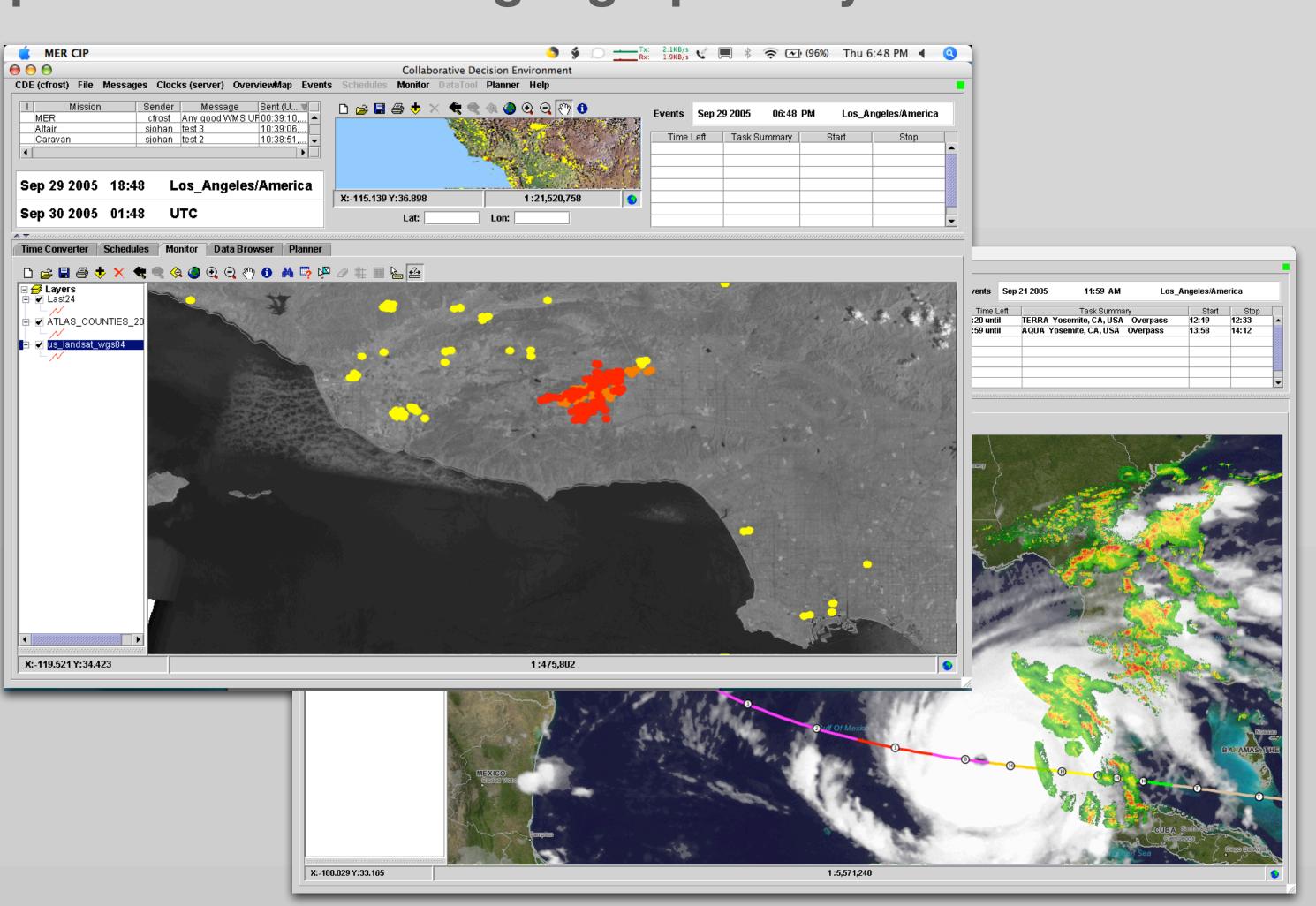






#### **COLLABORATIVE DECISION ENVIRONMENT**

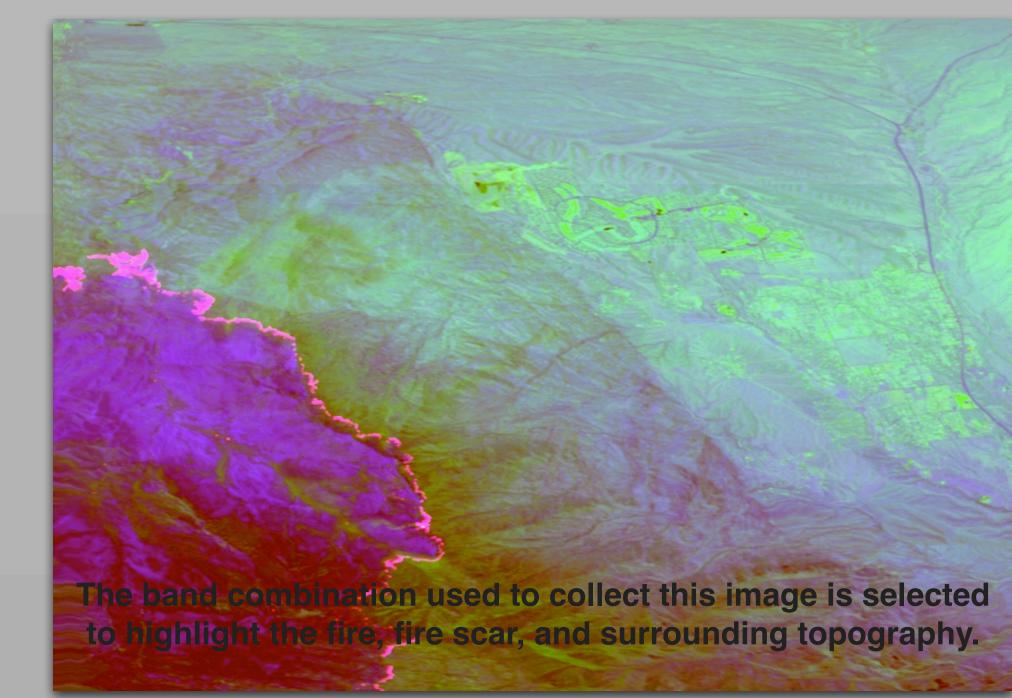
The Collaborative Decision Environment (CDE) provides a Java-based common interface for mission planning and evolution to scientists and mission personnel who are geographically distributed.



Based on the Mars Exploration Rover Collaborative Information Portal, the CDE includes significant new functionality to access both ESRI and OGC web map servers, providing access to a wide range of data essential to planning mission routes and activities. Examples include MODIS satellite fire detections, weather radar, winds aloft, storm track predictions, and satellite ground tracks. The CDE offers tools for event scheduling and tracking, messaging between team members, specification of mission objectives and constraints and monitoring of multiple assets during the course of a mission.

### SENSOR DATA PRODUCT & DELIVERY

Requests for data products are initiated through the CDE using a process defined by the Sensor Planning Service and delivered through Web Map Services. Device-independent electrical and software interface facilitates swapping sensors with minimum reengineering.



Partners:
National Aeronautics and Space Administration
US Dept. of Agriculture - Forest Service
US Dept. of the Interior - Bureau of Land Management